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Mercury pollution in the Finnish coastal waters

Veijo Miettinen
National Board of Waters
Water Research Office

Mercury pollution has been the most known, studied and argued case of pollution in Finland during last five years. In 1967 and 1968 about 500 fishes were analyzed by activation analysis (1). Large water areas along which much of the cellulose and chlorine industries of Finland are located show mercury contents over 1 ppm especially in pike, perch and burbot (see Fig.1).

In the beginning of the year 1968 cellulose industry gave up the use of phenyl mercury as slimicide. The decrease in the losses of the water soluble mercury compounds was about 90%. Also the chlorine industry has improved the treatment of the mercury containing waste waters. In 1970 the losses to the watercourses were below 0,1 tons, earlier about 4 tons/year.

Last year Water Research Office has begun to study the mercury problem in the Finnish watercourses. These studies have been done by analyzing fishes, bottom sediments and waste waters of industry. The pike (Esox lucius L.) has been used as an indicator fish.

Besides chlorine industry mercury losses to the watercourses have been observed trough one pesticide factory, zinc and copper ore processing plants, sulphuric acid plants and through industry, which uses large amounts of technical grade sulphuric acid. At each case the losses are some tens of kilograms/year. Instead of large losses Outokumpu Oy zinc ore processing plant at Kokkola now produces mercury about 20 tons/year.

In 1970 about 380 fishes were analyzed. The mercury content in pike did not show any significant decrease in the water areas where the content earlier exceeded 1 ppm (see Fig.1). The widest mercury polluted coastal areas in Finland are around Kotka, Pori and Oulu.

To the Kotka coastal area flows the river Kymijoki along which is produced more cellulose/m^3 water than anywhere else in the world.

Before reaching the Finnish Gulf the river branches.to western and eastern fork. In the river itself the mercury content in pike is about 1,8 ppm (mean of 10-20 fishes). The western fork forms a lake, Lake Tammijärvi, where the conditions for the enrichment of mercury to fishes have altered from those of the river. The mercury content in pike of the lake is about 4 ppm. In the Ahvenkoski coastal area outside this western fork the mercury content in pike is about 2,4 ppm, but around Kotka outside the eastern fork about 1,6 ppm.

In the river Kokemäenjoki the mercury content in pike is about 1,2 ppm and in the coastal waters outside Pori about 1,1 ppm.

According to Matikainen (2) the mercury contents in pike outside the river Kymijoki and the river Kokemäenjoki are directly proportional to the amounts of fenyl mercury asetate per m^3 of flowing river water used in the cellulose industry along these rivers. Along both of these rivers there is also chlorine industry, but according to my own studies in the river Kokemäenjoki this industry has not increased the over 1 ppm mercury level in pike in this river. However the mercury of the bottom sediments downstream from a chlorine factory may delay the decrease in the mercury contents of fishes.

Outside Oulu the mercury content in pike is about 1,2 ppm. Here exept pike, burbot and perch higher than natural concentrations of mercury has been found also in whitefish and vendace. We do not yet know if this is due to the ecology of these fishes or due to the fact that here most of the mercury has not come by the river but straight released to the coastal brackish water, where the conditions for the mobilization of mercury are different from those of polluted river water.

There are mercury polluted coastal areas also outside the river Eurajoki (a paper mill) and outside Vaasa (a pesticide factory). In all other coastal areas the mercury content of fish is about 0,1 - 0,3 ppm.

During last years the mercury pollution has considerably disturbed the fisheries in Finland also in areas where no pollution occur. On the 9th of July 1971 National Board of Health gave recommendations on the consumtion of the mercury contaminated fish and on the

fisheries in the mercury polluted water areas.
According to these recommendations

- fish that contains mercury over 1 ppm should not be used for human consumption
- fish that contains mercury 0,5 - 1 ppm should not be eaten more than once or twice a week
- mercury content in canned fish or fish products made in Finland or imported here should not exceed 0,5 ppm
- fishery should not be carried on in Lake Tammijärvi and in the Ahvenkoski coastal area

Because any restrictions and fishing bans has not been given the situation has not actually much changed. The mercury pollution may last for years or tens of years so in long-range plans we must prefer the restoration of the mercury polluted water areas to the fishing bans.

References

1. Sjöblom,V. and Häsänen, E. Kvicksilverhalten i fisk i Finland. Nordisk symposium kring kvicksilverproblematiken. Lidingö 1968.
2. Matikainen, M. Elohopean ympäristövaikutukset. Rikkihappo Oy 1970.

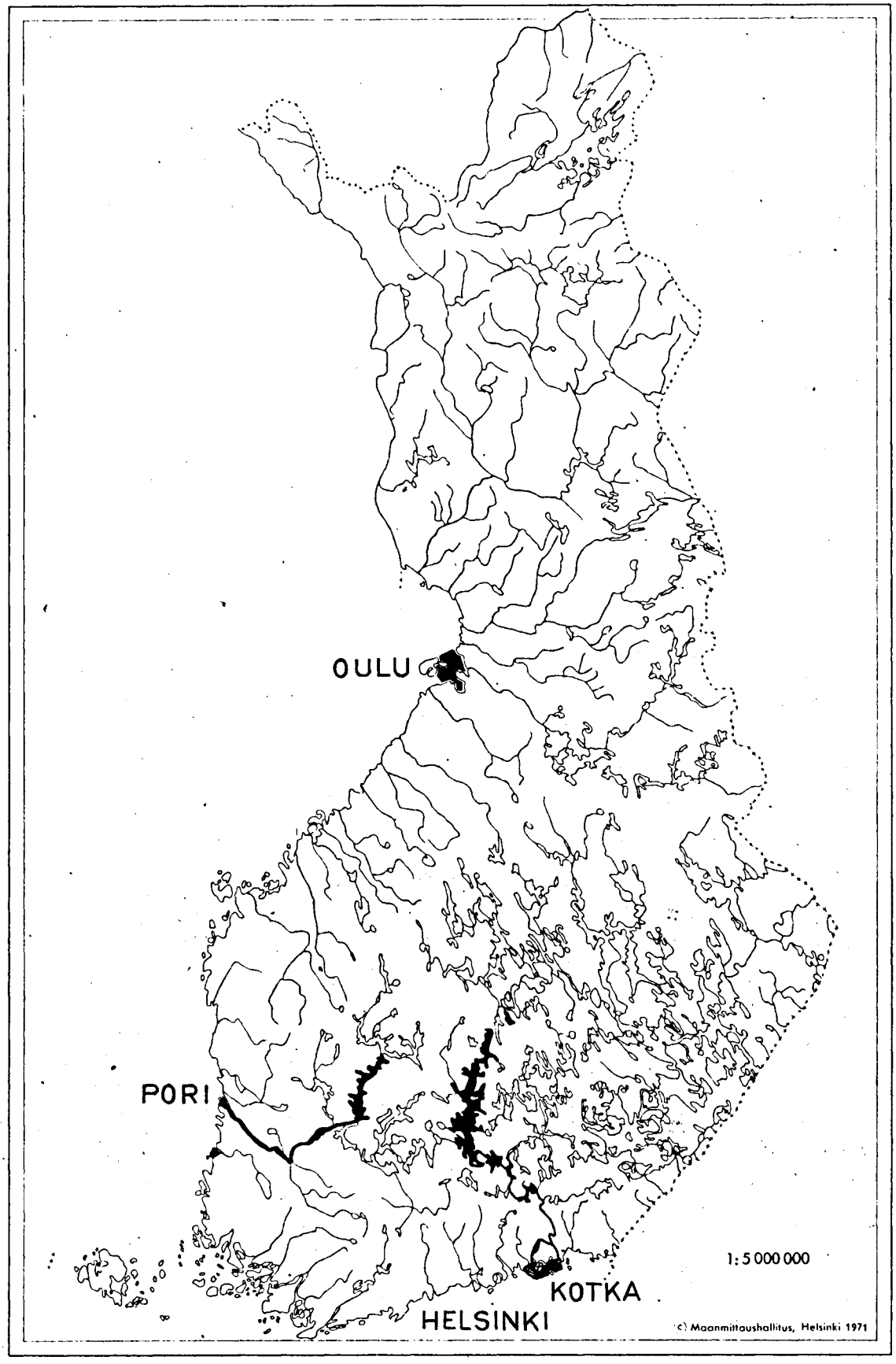

Figure 1

Mercury content in pike (Esox lucius L.) in Finland in 1967-70. Black areas mean content exceeding 1 ppm